Teun Koetsier, "The inflexion circle in the history of kinematics". Pp. 83-92 in G. Wolfschmidt (ed.), “Es gibt für Könige keinen besonderen Weg zur Geometrie”. Festschrift für Karin Reich. Augsburg: ERV Dr. Erwin Rauner Verlag, 2007

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The inflexion circle in the history of kinematics. (English)

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As pars pro toto, Koetsier uses the evolving understanding of the inflexion circle to illustrate the development of planar kinematics as a mathematical discipline. Though the word was created (as cinématique) by Ampére, Koetsier takes as his starting points Huygens' work on the cycloid and on the relation evolute/involute and, in detail, Philippe de la Hire's investigations (Traité des roulettes, 1706) of what happens to the points in two Euclidean planes when a (smooth) curve in one plane rolls on another curve in the other plane. Each point in the moving plane then describes a generalized cycloid in the other plane; while working toward more sophisticated theorems, de La Hire discovered that points in the moving plane which at a given moment are on an inflection point on its generalized cycloid form a circle - namely the inflexion circle. Koetsier follows de la Hire's original proof on the original diagrams, which requires the reader to understand the infinitesimal geometric arguments of the epoch, but he does offer some assistance. The second-last section of the article presents Cauchy's discovery that every not purely translatory smooth movement of one Euclidean plane over another one can be described as rotation around a moveable point; the paths of this moveable centre in the two planes are precisely the two curves considered by de La Hire, for which reason de La Hire's seemingly restricted result turns out to hold more generally. The last section presents an analytical proof, due to Oene Bottema.

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